CANADIAN SPACE AGENCY

2009-2010

Departmental Performance Report

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Minister of Industry

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MINISTER'S MESSAGE

Last year, Canada was the last country to fall into the global recession. Today, our economy is beginning to emerge in the strongest position of any advanced country in the world. Investment and key stimulus measures as part of Year 1 of Canada's Economic Action Plan provided continued results and helped set Canada apart from its G-8 counterparts in terms of economic strength.

In 2009-2010, Industry Canada worked quickly with its Portfolio Partners to deliver timely and targeted stimulus initiatives. Composed of Industry Canada and 10 other agencies, Crown corporations and quasi-judicial bodies, the Portfolio helps the Department to build a more productive and competitive economy.

The Government of Canada has allocated $110 million in Economic Action Plan funding over three years to the Canadian Space Agency. These funds will contribute to the development of terrestrial prototypes for space robotic vehicles, such as the Mars Lander and Lunar Rover, and other advanced space technologies. The Agency actively consulted with Government, academic and industrial stakeholders and refocused its activities to meet the priorities of Canada. The result of this ongoing and strengthening relationship is clearly being shown in the provision of critical cross-cutting space-derived information that is helping Government departments and agencies to better serve the needs of Canadians.

Moving forward, Industry Canada will continue to ensure that the jobs and industries of the future are created right here in Canada. We will follow through on delivering existing stimulus plans and continue to support government priorities. This means ensuring that we have the right conditions and regulatory frameworks in place to encourage investment in Canada, increasing support for R&D to improve Canada's long-term competitiveness and developing a digital economy.

I will work with the Industry Portfolio Partners, the private sector and other governments to enhance Canada's productivity and create the foundation for strong, sustainable and balanced growth.

It is my pleasure to present this year's *Departmental Performance Report* for the Canadian Space Agency.

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Tony Clement,
Minister of Industry

PRESIDENT'S MESSAGE

It gives me pleasure to report on the performance of the Canadian Space Agency under my first full year as President. The year was marked by a number of concerted efforts that are aligning the Programs and expenditures of the Canadian Space Agency and improving our management and performance to better meet the needs and priorities of the Government of Canada.

Over the past year, the Agency conducted a vast consultation of senior executives of other government departments, academia and industry stakeholders and heads of space agencies. These discussions and the input received from these key stakeholders are helping shape the future direction of the Agency and providing insight into the formulation of an integrated and strategic space plan focused on the current and future priorities of Canada and Canadians. This consultation has lead to a re-examination of the organizational structure of the Agency to ensure that the management of programs activities are carried out in both an effective and efficient manner, while making the best and judicious use of funds allocated by Parliament.

The reorganization of the Agency's business lines is aligned with a new Program Activity Architecture that will be introduced in 2011 and is designed to achieve the following objectives:

- Increase service to Government departments and expand the use of space data and information to respond to Canadians needs;
- Expand Canadian space expertise and enhance synergy between government, academia and industry partners;
- Foster operational excellence and effectiveness by promoting a consistent vision and direction on programs and projects throughout their life cycle; and,
- Strengthen the Agency's role in positioning Canada to play a key role in future space exploration missions.

This report also documents how the Agency is supporting the priorities of the Canadian Government and delivering social and economic benefits to Canadians from our outstanding space achievements such as the RADARSAT Earth Observation satellites, the contribution of an advanced robotics suite including Canadarm2, the Mobile Base System and Dextre, a two-armed dexterous robot, to the International Space Station (ISS), and, the successful flight demonstration of the Ka-band broadband capabilities aboard the Anik F2 communications satellite.

As a result of the 2008-2009 Strategic Review of Programs and Expenditures, significant progress has been made to strengthen planning, project management and risk mitigation of complex space projects and missions. At the same time, the Agency renewed its Grants, Contributions and Sponsorship Program to focus support for Research, Awareness and Learning in Space Science and Technology, and began work to extend to 2019, Canada's privileged cooperation agreement with the European Space Agency. Among its remarkable successes, the CSA notes that its forecast for the use of RADARSAT-2 Earth Observation imaging by Government departments and agencies was fully met during its first year of operations.

It is my pleasure to submit, for tabling in Parliament, the Canadian Space Agency's Departmental Performance Report for 2009-2010. Together, by building academic and industrial capacity, strengthening synergy and leveraging opportunities with our international partners, the Agency will continue to contribute to helping the Government maximise the strategic use of space to meet the needs of Canadians and strengthen our place in the global knowledge economy.

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Steve MacLean,
President

SECTION 1: OVERVIEW

1.1 RAISON D'ÊTRE AND RESPONSIBILITIES

The mandate of the Canadian Space Agency (CSA) is *"to promote the peaceful use and development of space, to advance the knowledge of space through science and to ensure that space science and technology provide social and economic benefits for Canadians".*

The CSA is achieving this mandate in cooperation with other government departments/agencies, industries, and universities, as well as international partners. In addition to delivering its own programs, the CSA is responsible for coordinating all federal civil space-related policies and programs pertaining to science and technology research, industrial development, and international cooperation.

To learn more about the mandate of the Canadian Space Agency, go to:
http://www.asc-csa.gc.ca/eng/about/mission.asp

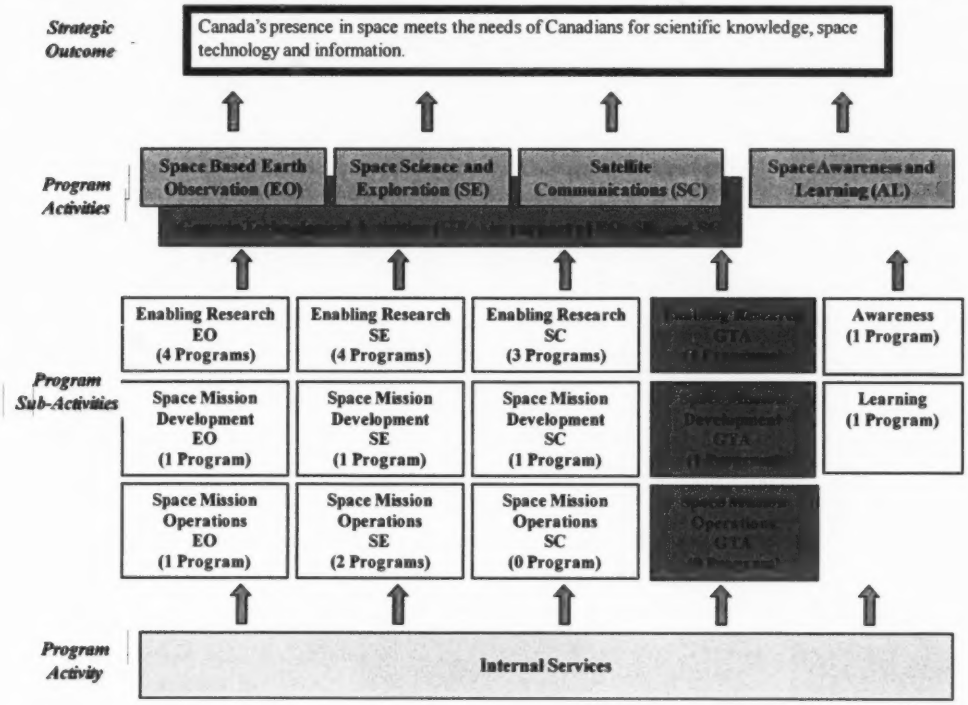
The Canadian Space Strategy (CSS) approved by the Government of Canada in February 2005 guides the Agency in the management of its programs. The Strategy is instrumental in focusing decision-making at the CSA and aligning all space related program activities through its strategic outcome and long-term priorities.

To learn more about the Canadian Space Strategy, go to:
http://www.asc-csa.gc.ca/asc/eng/resources/publications/default.asp

The release in 2007 of the Government's Science and Technology Strategy – *Mobilizing Science and Technology to Canada's Advantage* – provides the CSA with a solid framework with which to prioritise CSA programs and initiatives to "make Canada a world leader in science and technology and a key source of entrepreneurial innovation and creativity".

To learn more about the Canada's Science and Technology Strategy, go to:
http://www.ic.gc.ca/epic/site/ic1.nsf/en/h_00231e.html

1.2 STRATEGIC OUTCOME AND PROGRAM ACTIVITY ARCHITECTURE


Strategic Outcome
Canada's presence in space meets the needs of Canadians for scientific knowledge, space technology and information.
Program Activities
Space Based Earth Observation (EO)
Space Science and Exploration (SE)
Satellite Communications (SC)
Space Awareness and Learning (AL)
Enabling Research EO (4 Programs)
Enabling Research SE (4 Programs)
Enabling Research SC (3 Programs)
Awareness (1 Program)
Program Sub-Activities
Space Mission Development EO (1 Program)
Space Mission Development SE (1 Program)
Space Mission Development SC (1 Program)
Learning (1 Program)
Space Mission Operations EO (1 Program)
Space Mission Operations SE (2 Programs)
Space Mission Operations SC (0 Program)
Program Activity
Internal Services

Strategic Outcome

Since 2007-2008, all program activities contribute to a single Strategic Outcome: "*Canada's presence in space meets the needs of Canadians for scientific knowledge, space technology and information*".

Program Activities[1]

Space Based Earth Observation (EO): To develop and operationalize the use of Space Based Earth Observation for the benefit of Canadians, especially in the fields of environment, resources and land use management, as well as security and foreign policy. In doing so, the CSA maintains and expands Canada's leadership in EO technologies to obtain the timely, relevant and essential information we need to make judicious decisions about our collective future.

Space Science and Exploration (SE): To better understand the solar system and the Universe; expand our knowledge on the constituent elements and origins of life; and strengthen a human presence in space. In doing so, the CSA sustains and increases Canada's contribution to humankind's scientific knowledge, to the exploration of our solar system and the Universe and to the development of related technologies.

[1] Description of Program Activities are taken from the Main Estimates available on line: http://www.tbs-sct.gc.ca/est-pre/estime.asp

Satellite Communications (SC): To provide all Canadians with the means to participate and fully benefit from the global information age. In doing so, the CSA upholds Canada's status as a world leader in Satellite Communications and extends the most advanced products and services to all Canadians.

Generic Technological Activities (GTA): To provide leadership, coordination or support to Earth Observation, Space Science and Exploration, and Satellite Communications through activities that are generic in their nature since they contribute to all three program activities.

Space Awareness and Learning (AL): To further public understanding and engagement with regards to space related issues, ultimately improving the scientific literacy of Canadians by carrying out a national awareness and learning initiative in support of the CSA programs.

Internal Services: To implement the government's commitment to modern public service management in accordance with the Management Accountability Framework's (MAF) expectations.

CSA Organizational Structure

Reporting to the Minister of Industry, the Canadian Space Agency's Chief Executive Officer is the President, assisted by the Executive Committee, which is composed of the Senior Vice-President, four Directors General (Space Science, Space Technologies, Space Programs, and Operations Branches) as well as the Chief Financial Officer, the Chief Human Resources Officer, and the Director of Communications and Public Affairs. This organizational structure became effective on January 2, 2008.

In 2009-2010, the CSA reviewed its organizational structure to better deliver on government priorities and requirements. The new organizational structure became effective on April 1, 2010. The President of the Canadian Space Agency is assisted by the members of the new CSA Executive Committee: Vice-President, four Directors General (Space Utilization, Space Exploration, Space Science and Technology, Corporate Services) as well as the Chief Financial Officer, the Chief Human Resources Officer, and the Director, Communications and Public Affairs.

1.3 PERFORMANCE SUMMARY

1.3.1) Program Activity Alignment to Government of Canada Outcomes

Program Activity ($ in millions)	2008-2009 Actual Spending	2009-2010				Alignment to Government of Canada Outcomes
		Main Estimates	Planned Spending	Total Authorities	Actual Spending	
Space Based Earth Observation (EO)	63.0	85.8	89.9	87.3	75.5	A Clean and Healthy Environment
Space Science and Exploration (SE)	161.4	143.3	143.3	168.7	153.6	A Strong and Mutually Beneficial North American Partnership
Satellite Communications (SC)	27.1	20.3	20.3	20.6	19.7	A Safe and Secure Canada
Generic Technological Activities (GTA) in support of EO, SE and SC	47.5	53.8	53.8	55.0	43.0	An Innovative and Knowledge-Based Economy
Space Awareness and Learning (AL)	7.1	8.9	8.9	8.9	5.9	A Vibrant Canadian Culture and Heritage
Internal Services[3]	N/A	43.0	43.0	45.9	46.9	Not applicable (N/A)
TOTAL	**306.0**	**355.1**	**359.2[2]**	**386.4**	**344.6**	

Notes: 1. Totals may not add due to rounding.

2. Variance of $4.1 million between TOTAL $355.1 million for Main Estimates and TOTAL $359.2 million for Planned Spending is caused by the planned reinvestment of royalties from the sale of RADARSAT-1 data under the Space Based Earth Observation Program Activity.
3. Commencing in the 2009-2010 Estimates cycle, the resources for the Internal Services program activity are displayed separately from other program activities; they are no longer distributed among the remaining program activities, as it was the case in previous Main Estimates. This has affected the comparability of spending and FTE information by program activity between fiscal years.

An increasing number of countries are now involved in the peaceful development and use of space. A large number of satellites are expected to be launched over the next ten years. Two-thirds of these satellite projects will serve government programs in Earth Observation and Space Science and Exploration while most of the commercial investments are mainly related to Satellite Communications. The Canadian government investments in these three fields are guided by the Canadian Space Strategy in order to meet the needs of Canadians for scientific knowledge, space technology and information.

Canada is at a crossroads where major projects initiated in the 90's have been delivered and are now operational, and opportunities to collaborate with international partners in major space missions are growing. The major projects that are now fully operational consist of RADARSAT-2 Earth observation satellite, the contribution of an advanced robotics suite including Canadarm2, a Mobile Base System and Dextre, the two-armed dexterous robot, to the International Space Station (ISS), and, the successful flight demonstration of the KA broadband capabilities aboard the Anik F2 communications satellite. These and other remarkable accomplishments, combined with sustained contribution by Canadian astronauts to international space exploration missions, have continued to brand Canada as a science and technology focused and reliable trading partner.

In 2009-2010, the CSA conducted a series of extensive consultations with its stakeholders and partners in order to move forward with a renewed impetus to sustain and enhance Canada's space advantage. At the request of the Government, the CSA has been developing a Long Term Space Plan. This plan would propose ways to achieve the Government's strategic and public policy interests with recommendations for Canada's role and participation in future space exploration activities. The critical challenges that Canada faces related to space consist of increasing significantly the use of space data and information by the Government of Canada to serve its strategic and public policy interests, ensuring the sustainability and capacity of its space industry and academia and, strengthening its international partnerships through meaningful, leading-edge contributions.

The CSA made adjustments in a number of program management areas as a follow-up to the 2008-2009 Expenditure Strategic Review and Program Evaluations:

- Significant progress was made in strengthening planning, project management and risk mitigation of complex space projects and missions. The CSA submitted to Treasury Board Secretariat (TBS) a draft of its Investment Plan to meet the standards set by the new Government Wide Investment Planning – Assets and Acquired Services and Management of Projects Policies. The Plan includes an Organizational Project Management Capacity Assessment and Project Complexity, and Risk Assessments.

- A renewed Grants, Contributions and Sponsorship Program to support Research Awareness and Learning in Space Science and Technology was implemented. Collaborations with other Granting Councils were initiated to strengthen the leverage of CSA's investments and expand the partnership between government, academia and space industry.

- Government departments and agencies are consistently increasing their use of RADARSAT-2 Earth Observation imaging since it started operations in April 2008. The CSA has met its forecasts established for the first full year of operations.

- Work has begun to renew and extend to 2019 the existing agreement with the European Space Agency which leads to outstanding collaboration between the European and the Canadian science and space industry communities.

1.3.2) Performance Status

2009-2010 Financial Resources ($ in millions)

Planned Spending	Total Authorities	Actual Spending
359.2[1]	386.4	344.6

1. Variance of $4.1 million between TOTAL $355.1 million for Main Estimates and TOTAL $359.2 million for Planned Spending is caused by the planned reinvestment of royalties from the sale of RADARSAT-1 data under the Space Based Earth Observation Program Activity.

Any significant variance reported against Planned Spending set out in the 2009-2010 Report on Plans and Priorities is explained in Section 3.3.1 – Spending by Program Activity.

2009-2010 Human Resources (FTEs)

Planned	Actual	Difference
711.2	662.9	48.3

Any significant variance reported against Planned FTEs set out in the 2009-2010 Report on Plans and Priorities is explained in Section 3.3.2 – FTEs Variance.

CANADIAN SPACE AGENCY STRATEGIC OUTCOME Canada's presence in space meets the needs of Canadians for scientific knowledge, space technology and information.	
PERFORMANCE INDICATORS	**2009-2010 PERFORMANCE**
1. Canada's rank in terms of support for peaceful space-related R&D; the measurement will provide the list of CSA missions, looking 10 years into the future and identifying the following for each mission: - the CSA's role (leader or partner); and, - the CSA's contribution (%) to the total mission budget.	In 2009, Canada was positioned 7th among 18 space-faring OECD nations in government investments in civil space programs. The order of investment is as follows: USA, Japan, France, Germany, Italy, UK, Canada, S-Korea, Spain, Belgium, Netherlands, Switzerland, Sweden, Austria, Finland, Turkey, Denmark and Portugal. This list does not include non-OECD members who are major space-faring nations such as Russia, India, China and Brazil.

Indicator 1 – Performance Analysis

Canada's ranking among space-faring OECD nations is a partial indicator unless edified with complementary information such as a full spectrum of the level of support for each mission, an assessment of their level or diversity as well as the alignment with the Government of Canada and department's priorities. However, Canada's rank moved from 9th position to 7th in 2009.

Source: EUROCONSULT: Civil Space Expenditures among Space-Faring OECD member-states, 2009.

CANADIAN SPACE AGENCY STRATEGIC OUTCOME Canada's presence in space meets the needs of Canadians for scientific knowledge, space technology and information.	
PERFORMANCE INDICATORS	**2009-2010 PERFORMANCE**
2. State of the scientific, industrial and public sector communities involved in the space sector: - number of universities, companies and organizations involved; - number of people employed in space-related jobs; and, - number of corresponding FTEs in academia, industry and government.	The 2009 data were not available at the time this report went to press.
Indicator 2 – Performance Analysis The state of the Canadian Space sector, is based on a confidential survey conducted by the CSA and completed on a voluntarily basis by representatives of Canada space sector. For the time being, this survey is the only source providing a pulse of the Canadian space community. It is precious and reliable as long as necessary resources are provided to sustain or even improved its response's levels. The results gathered by this survey are key in the analysis of the Agency's strategic result. The data collected in 2008 reported a space workforce of 6,742 people (6,205 in the private sector and 537 in the public sector) distributed among 215 organizations (130 companies, 35 universities, 28 federal departments and agencies and 22 other organizations such as not-for-profit associations and research centers). Source: State of the Canadian Space Sector for 2008, (2009).	
3. Access and utilization by the Canadian government and industry of space data generated by Canadian space missions.	A total of 15 Other Governmental Departments (OGDs) have acquired space data from the 3 following satellites supported by the CSA: RADARSAT-1, RADARSAT-2 and ENVISAT.
Indicator 3 – Performance Analysis Reported for the first time, this indicator identifies that among the 15 OGDs space data users, 30% (5/15) use data from more than one of CSA's supported satellites. However, it is important to flag that 75% of the data acquisition is made by the following 5 OGDs: Environment Canada, National Defense and Canadian Forces, Natural Resources Canada, Fisheries and Oceans Canada, and Agriculture and Agri-Food Canada. With only one year of reporting, the analysis of this indicator is limited. Source: Internal reporting documents.	

Program Activity – Space Based Earth Observation (EO)						
OPERATIONAL PRIORITY			**TYPE**		**STATUS**	
Develop and operationalize the use of Space Based EO for the benefit of Canadians.			Ongoing		Mostly Met	
TARGET ACHIEVEMENTS (PROGRAM SUB-SUB-ACTIVITIES)	**ACHIEVED VS PLANNED TARGETS**					
	2007-2008		**2008-2009**		**2009-2010**	
	23/23	100%	13/15	87%	14/15	93%
TENDENCY (Starting base value = 82%)	⇧		⇧		⇧	

Tendency is established by comparison with the starting base value of 82% set in 2005-2006.

In 2009-2010, only one of the 15 indicators was partially met. Its target was overly optimistic and therefore only one project reached the developmental phase.

MAIN ACCOMPLISHMENTS OVER THE LAST 3 YEARS (2007-2008 TO 2009-2010)

The CSA maintained and expanded Canada's leadership in Earth observation technologies to obtain the timely, relevant and essential data needed to make judicious decisions about our collective future especially in the fields of environment, resources and land use management, as well as security and foreign policy. As a result, over the last 3 years:

- A total of 13 missions were either considered or undertaken generating 80 partnerships with the industry, universities or other Canadian government organizations;
- 63 applications emerged from EO technology development programs;
- RADARSAT-1 began its 15th year of operation in November 2009 and RADARSAT-2 its second and SCISAT-1 its 6th, since October 2003; and,
- Canada's partnership with the European Space Agency for this Program Activity provided an average "Industrial return coefficient" of 1.18 compared to an expected return of at least 0.84.

A total of $175.1 million was spent over the 3 year period.

AREAS OF IMPROVEMENT

Through the Government Related Initiative Program, the use of RADARSAT-2 Earth observation imaging by Government departments and agencies was strengthened.

Work has begun to extending 2019 the existing agreement between Canada and the European Space Agency which leads to outstanding collaboration between European and Canadian science and space industry communities.

For more detailed 2009-2010 performance information, go to: Section 2 - Analysis of Program Activities by Strategic Outcome

Program Activity – Space Science and Exploration (SE)

OPERATIONAL PRIORITY	TYPE	STATUS
Understand the solar system and the Universe, expand our knowledge of the constituent elements and origins of life, and strengthen the human presence in space.	Ongoing	Mostly Met

TARGET ACHIEVEMENTS (PROGRAM SUB-SUB-ACTIVITIES)	ACHIEVED VS PLANNED TARGETS					
	2007-2008		2008-2009		2009-2010	
	29/31	94%	22/23	96%	18/20	90%
TENDENCY (Starting base value = 83%)	⇧		⇧		⇧	

Tendency is established by comparison with the starting base value of 83% set in 2005-2006. Note the continued effort to rationalize the total number of indicators for program sub-sub-activities.

In 2009-2010, two of the 20 indicators were partially met, one due to lower survey response level (only 67%) received from Principal Investigators (PI) and the other because one project did not reach the operational level as planned.

MAIN ACCOMPLISHMENTS OVER THE LAST 3 YEARS (2007-2008 TO 2009-2010)

The CSA sustained and increased Canada's contribution to humankind's scientific knowledge, to the exploration of our solar system and the Universe and to the development of related technologies. As a result, over the last 3 years:

- A total of 27 missions were either considered or undertaken generating 402 partnerships with the industry, universities or other Canadian government organizations;
- Canadian astronauts participated in 3 missions;
- A total of 890 peer-reviewed papers acknowledged the CSA's contribution and 1,779 presentations were delivered;
- The CSA met year after year 100% of its requirements to the International Space Station program: the largest international scientific and engineering project ever undertaken; and,
- Canada's partnership with the European Space Agency for this Program Activity provided an average "Industrial return coefficient" of 0.90 compared to an expected return of at least 0.84.

A total of $424.2 million was spent over the 3 year period.

AREAS OF IMPROVEMENT

With the additional funding of $110 million allocated over the next three-year period, announced in the 2009 Budget, the CSA moved forward with the development of terrestrial prototypes for space robotic vehicles and the development of other advanced space technologies. In 2009-2010, ten existing contracts were extended and twelve new contracts were awarded under the CSA exploration core program.

A renewed Grants, Contributions and Sponsorship Program to support Research Awareness and Learning in Space Science and Technology was approved and implemented.

For more detailed 2009-2010 performance information, go to: Section 2 - Analysis of Program Activities by Strategic Outcome

Program Activity – Satellite Communications (SC)

OPERATIONAL PRIORITY	TYPE	STATUS
Provide all Canadians with the means to participate in and fully benefit from the global information age.	Ongoing	Not Met

TARGET ACHIEVEMENTS (PROGRAM SUB-SUB-ACTIVITIES)	ACHIEVED VS PLANNED TARGETS					
	2007-2008		2008-2009		2009-2010	
	7/8	88%	4/6	67%	3/6	50%
TENDENCY (Starting base value = 69%)	⇧		⇩		⇩	

Tendency is established by comparison with the starting base value of 69% set in 2005-2006.

In 2009-2010, three of the six indicators were not met. In one instance, the work was interrupted on the development of mission concepts that were under review. In another case, the planned development milestones were partially met for some projects. And lastly, no northern communities were yet able to use broadband telecommunications services as targeted under the Government of Canada Capacity Credit for Government Applications and Services.

MAIN ACCOMPLISHMENTS OVER THE LAST 3 YEARS (2007-2008 TO 2009-2010)

The CSA contributed to uphold Canada's status among world leaders in Satellite Communications and extend the most advanced products and services to all Canadians, including those living in northern communities. As a result, over the last 3 years:

- 8 technology demonstration projects were put forward;
- 1 joint study involving the departments of Transport Canada, National Defence, Environment Canada, and Indian and Northern Affairs was brought forward for consideration; and,
- Canada's partnership with the European Space Agency for this Program Activity provided an average "Industrial return coefficient" of 1.03 compared to an expected return of at least 0.84.

A total of $67.3 million was spent over the 3 year period.

AREAS OF IMPROVEMENT

Work related to implement access and use of Anik F2 broadband telecommunications has progressed with regards to the identification of potential end-users in the northern communities. This work contributes to the goal of making use of the Government of Canada capacity credit by 2011.

The CSA has engaged with Natural Resources Canada, Department of Foreign Affairs and International Trade, and Department of National Defence to improve the governance structure of global navigation satellite system (GNSS) activities within the federal government.

For more detailed 2009-2010 performance information, go to: Section 2 - Analysis of Program Activities by Strategic Outcome

Program Activity – Generic Technological Activities (GTA) in support of EO, SE and SC

OPERATIONAL PRIORITY	TYPE	STATUS
Provide leadership, coordination or support to Earth Observation (EO), Space Science and Exploration (SE), and Satellite Communications (SC) through generic technology research and space-qualification activities.	Ongoing	Mostly Met

TARGET ACHIEVEMENTS (PROGRAM SUB-SUB-ACTIVITIES)	ACHIEVED VS PLANNED TARGETS					
	2007-2008		2008-2009		2009-2010	
	7/8	88%	4/7	57%	5/6	83%
TENDENCY (Starting base value = 86%)	⇧		⇩		⇩	

Tendency is established by comparison with the base value of 86% set in 2006-2007.

In 2009-2010 one of the six indicators was partially met because the targeted number of licenses to be granted for space technologies was not reached.

MAIN ACCOMPLISHMENTS OVER THE LAST 3 YEARS (2007-2008 TO 2009-2010)

Through its investments in research-development and applications, and the resulting technology transfers to the private and public sectors, the CSA helped enhance the Canadian space industry's competitiveness and increase Canada's ability to compete in the global marketplace in the fields of Earth Observation, Space Science and Exploration, and Satellite Communications. As a result, over the last 3 years:

- A total of 11 patents were issued;
- On average per year, the David Florida Laboratory supported 6 CSA missions and 48 commercial projects; and,
- Canada's partnership with the European Space Agency for this Program Activity provided an average "Industrial return coefficient" of 1.05 compared to an expected return of at least 0.94.

A total of $131.3 million was spent over the 3 year period.

AREAS OF IMPROVEMENT

The CSA has developed a Technology Plan based on the needs of future missions. A preliminary list of niche technologies for Earth observation, satellite communication and space exploration has been established following internal consultations. Niche areas will be finalized after consultation with the government, industry and academia communities.

Using partnership, collaborative research and development programs, the CSA and Natural Sciences and Engineering Research Council of Canada (NSERC) supported 16 collaborative research projects which foster closer collaboration between the industry, universities and government in space research and technology development.

For more detailed 2009-2010 performance information, go to: Section 2 – Analysis of Program Activities by Strategic Outcome

Program Activity – Space Awareness and Learning (AL)

OPERATIONAL PRIORITY	TYPE	STATUS
Further public understanding and engagement with regards to space related issues, ultimately leading to improving the scientific literacy of Canadians.	Ongoing	Met all

TARGET ACHIEVEMENTS (PROGRAM SUB-SUB-ACTIVITIES)	ACHIEVED VS PLANNED TARGETS					
	2007-2008		2008-2009		2009-2010*	
	15/16	94%	3/3	100%	3/3	100%
TENDENCY (Starting base value = 94%)	=		⇧		NA	

* Note: Performance was established at the SA level only. The trend analysis is not available in 2009-2010 due to a review and realignment of the Program Activity Architecture which resulted in the deletion of the sub-sub-activity levels of the Space Awareness and Learning Program Activity.

MAIN ACCOMPLISHMENTS OVER THE LAST 3 YEARS (2007-2008 TO 2009-2010)

The CSA fostered science and technology literacy and offered opportunities to enhance the expertise of Canadian scientists, engineers and physicians in space science, space technology and space medicine. As a result, over the last 3 years:

- More than 4 million individuals have visited the CSA's website;
- The Canadian astronauts reached more than 290,000 individuals through public events;
- A total of 4,734 educators participated in professional development workshops and Canadian students were reached on more than 10 million occasions through the Space Learning Program; and,
- A total of 46 graduate students, fellows and medical residents were supported through the Program in support of Research and Training in space science, space technology and space medicine.

A total of $16.5 million was spent over the 3 year period.

AREAS OF IMPROVEMENT

A renewed Grants, Contributions and Sponsorship Program to support Research Awareness and Learning in Space Science and Technology was approved and implemented. It will support the development of learning activities in collaboration with science centres and museums, youth and science associations, and the education community across Canada.

For more detailed 2009-2010 performance information, go to: Section 2 – Analysis of Program Activities by Strategic Outcome

Program Activity – Internal Services

MANAGEMENT PRIORITY	TYPE	STATUS
Implement the Government's commitment to modernize Public Service management in accordance with the Management Accountability Framework.	Ongoing	Not met

TARGET ACHIEVEMENTS (PROGRAM SUB-SUB-ACTIVITIES)	ACHIEVED VS PLANNED TARGETS					
	2007-2008		2008-2009		2009-2010*	
	13/14	93%	3/6	50%	1/2	50%
TENDENCY (Starting base value = 93%)	Starting base		⇩		N/A	

* Note: Performance was established at the Sub-Activity level only, therefore the trend analysis is not available in 2009-2010.

MAIN ACCOMPLISHMENTS OVER THE LAST 3 YEARS (2007-2008 TO 2009-2010)

A 3-years summary is unavailable this year because this section appeared for the first time in 2008-2009.

AREAS OF IMPROVEMENT

In order to align strategies, planning priorities, funding levels, and operations with its long term vision the CSA has reviewed its organizational structure and, has submitted a revised Program Activity Architecture (PAA) to Treasury Board Secretariat (TBS). The new PAA was integrated in the corporate work planning, financial planning, and control systems in time for the 2011-2012 Annual Reference Level Update.

Significant progress was made in strengthening planning, project management and risk mitigation of complex space projects and missions. The CSA submitted to TBS a draft of its Investment Plan to meet the standards set by the new Government Wide Investment Planning – Assets and Acquired Services and Management of projects Policies.

For more detailed 2009-2010 performance information, go to: Section 2 – Analysis of Program Activities by Strategic Outcome

1.4 RISK ANALYSIS

STRATEGIC CONTEXT OF THE CANADIAN SPACE AGENCY

INTERNATIONAL CONTEXT

Space is recognized by industrialized nations as an essential and strategic tool to meet their social, economic, and foreign policy objectives. Accordingly, many governments around the world of traditional and emerging spacefaring nations are increasing their investments in space activities, looking for increased consolidation and the advancement of their space capabilities.

International cooperation is critical to the implementation of the Canadian Space Strategy. Canada is working in partnership with other spacefaring nations, particularly through its longstanding relations with the National Aeronautics and Space Administration (NASA) and the European Space Agency (ESA). Through these partnerships, Canada can leverage its resources and maximize its return on investment while sharing technical expertise, knowledge, and infrastructure, and gaining access to areas where Canada has chosen not to invest due to limited resources. In addition, there are increasing concerns over issues such as space security, access, weather, debris and climate change. These issues transcend national borders and favour increasing cooperation between nations with common goals. Canada's space infrastructure must not only meet national strategic needs, but must also play a tangible role in responding to issues of interest to the international community.

Canada is regarded as a reliable partner that possesses unique technical and scientific capabilities, and as a nation that can meaningfully contribute to the initiatives of foreign space agencies. In particular, emerging space-faring countries in Asia and South America may offer great potential for future cooperation. Thus, Canada continues to deploy its efforts to gain a foothold in these emerging markets. It is of paramount importance that the Canadian Space Agency continues to work with its stakeholders to ensure the competitiveness of our research and business communities in the world markets. Canada's space industry is perceived as internationally competitive. This was confirmed in 2009[2] by the results of the 2008 Annual Survey of the Canadian Space Sector[3]. With yearly revenues of $2,793 billion, $1.405 billion derived from exports, representing 50% of the industry's total revenues. The main destinations of Canadian exports are:

- The United States remains the largest market accounting for 52.1% (or, $733 million) of the $1,405 billion of total exports. Europe falling second, accounting for 28.4% (or, $399.5 million);
- Export revenues from Oceania increased by 7.5% - from $47.6 to $51.2 million;
- Export revenues from South America increased by 63.8% - from $31.8 to $52.1 million; and,
- Export revenues from Africa increased by 71.4% - from $5.4 to $8.9 million.

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[2] The 2010 results from the 2009 Annual Survey of the Canadian Space Sector were not available at the time this report went to press.

[3] CSA: State of the Canadian Space Sector 2008 (2009); Overall Revenues, Domestic v. Export Revenues.

NATIONAL CONTEXT

The Canadian Space Agency recognizes that the best means of turning scientific and technological advancements into innovative products and services is through partnerships with Canadian universities and businesses. With its highly skilled workforce, our space industry not only generates wealth in our economy, but also provides competitive products and services. Given that the national market is relatively small, it is critical that the Canadian space industry be able to leverage foreign investments and generate export sales. Capitalizing on export revenue depends on the industry's ability to commercialize highly competitive products and services, and establish local and international partnerships.

In 2008[4], Satellite Communications sector continued to generate almost 77% of Canada's $2,793 billion in space sector revenues. Moreover, the sector saw an increase of 17.1% (from $1,832 billion to $2,146 billion) during that year. A breakdown of the total $2,793 billion in revenues by sectors of activity reads as follows:[5]

- Satellite Communications: 76.8% ($2,146 billion);
- Navigation: 9% ($254 million);
- Earth Observation: 7.1% ($200 million);
- Robotics: 4% ($110 million);
- Space Science: 2% ($68 million); and,
- Space-related activities in other areas: 0.5% ($16 million).

While small in terms of the number of firms, the Canadian space sector is knowledge-intensive and is at the forefront of research and innovation. Building on the strengths of 6,742 skilled workers, including 2,189 highly qualified personnel, they have acquired world-leading capabilities in niche areas such as Earth observation, space robotics, scientific instruments, communications and navigation satellites.

To learn more about Canadian space-related organizations, go to:
http://www5.asc-csa.gc.ca/eng/industry/csd.asp

To encourage sustainable industrial regional development and to maximize benefits to all Canadians, the CSA uses the following regional distribution objectives as guidelines for its investments in space: 10% in British Columbia; 10% in the Prairies; 35% in Ontario; 35% in Quebec; and, 10% in Atlantic Canada. The data presented in the graphic below accounts for all Government space-related funding for the period from April 1988 to March 2010.

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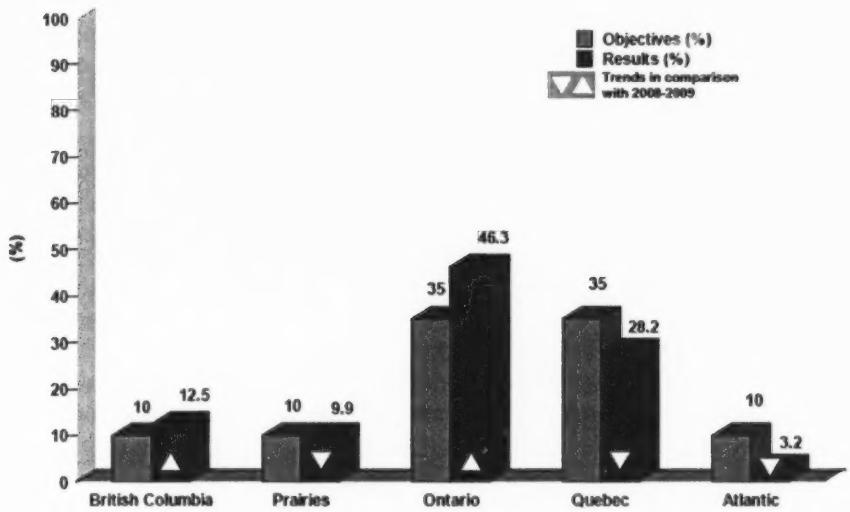
[4] The 2010 results from the 2009 Annual Survey of the Canadian Space Sector were not available at the time this report went to press.
[5] CSA: State of the Canadian Space Sector 2008 (2009).

Regional Distribution of Government Space Related Funding
(as of March 31, 2010)



Source: CSA Organized Research Information System (ORIS), March 31, 2009.

GOVERNMENT CONTEXT

1- The Canadian Space Strategy

Approved by the Government of Canada in February 2005, the Canadian Space Strategy was developed in full consultation with Government of Canada organizations and Canadian stakeholders. It is the framework that guides all CSA programs and provides our stakeholders and partners with insight on Canada's strategic directions. While the Canadian Space Strategy preceded the Science and Technology (S&T) Strategy, it embraces the principles of world-class excellence, and contains a similar set of priorities and innovative national partnerships. To learn more about the Canadian Space Strategy, go to: http://www.asc-csa.gc.ca/eng/publications/default.asp#strategy

2- The Canadian Science and Technology Strategy

The objective of the Government S&T Strategy is to "make Canada a world leader in science and technology and a key source of entrepreneurial innovation and creativity". In order for Canada to achieve this objective, the S&T Strategy identifies the following three underlining conditions for success: a strong private-sector commitment to S&T, a strengthened knowledge base and, be a magnet for talent. In 2008-2009, the CSA undertook a Strategic Review to evaluate its programs and ensure that they were aligned with the Government's S&T Strategy. Adjustments made in 2009-2010 to continue meeting the needs and priorities of Canadians are described in the sections *Area of improvement* in the *Performance Summary*. To learn more about the Canadian Science and Technology Strategy, go to: http://www.ic.gc.ca/epic/site/ic1.nsf/en/h_00231e.html

3- *Corporate Risk Management*

For 2009-2010, the CSA has implemented mitigation action plans addressing the two highest priorities identified in the CSA corporate risk profile:

1. The capacity of CSA to align its strategies, planning, priorities, funding levels, operations and capacity to deliver, and to obtain clear understanding and buy-in from managers and staff. Six of 12 actions were completed among them:

- The Draft of its Investment Plan meeting the standards set by the new Government wide Investment Planning – Assets and Acquired Services Policies was submitted to TBS;
- Corrective actions were completed in response to the internal Audit Report on Project Management; and,
- A business plan was implemented to improve project cost estimation.

The CSA concluded that this corporate risk remains a high priority and it will pursue a series of ongoing and new mitigation actions in 2010-2011:

- Continue developing and advancing the Long Term Space Plan;
- Establish External Advisory Committees for the Agency and each Program Activity;
- Develop an Acquisitions Strategy and a multi-year Acquisition Plan;
- Develop a CSA Policy on Project Costs Allocation;
- Complete actions in response to external and internal audits on risk management; and,
- Establish Cost Estimation and Review Team.

2. The capacity of the CSA to hire and maintain a highly-qualified workforce of public servants to deliver its mandate. Five of seven actions were completed among them:

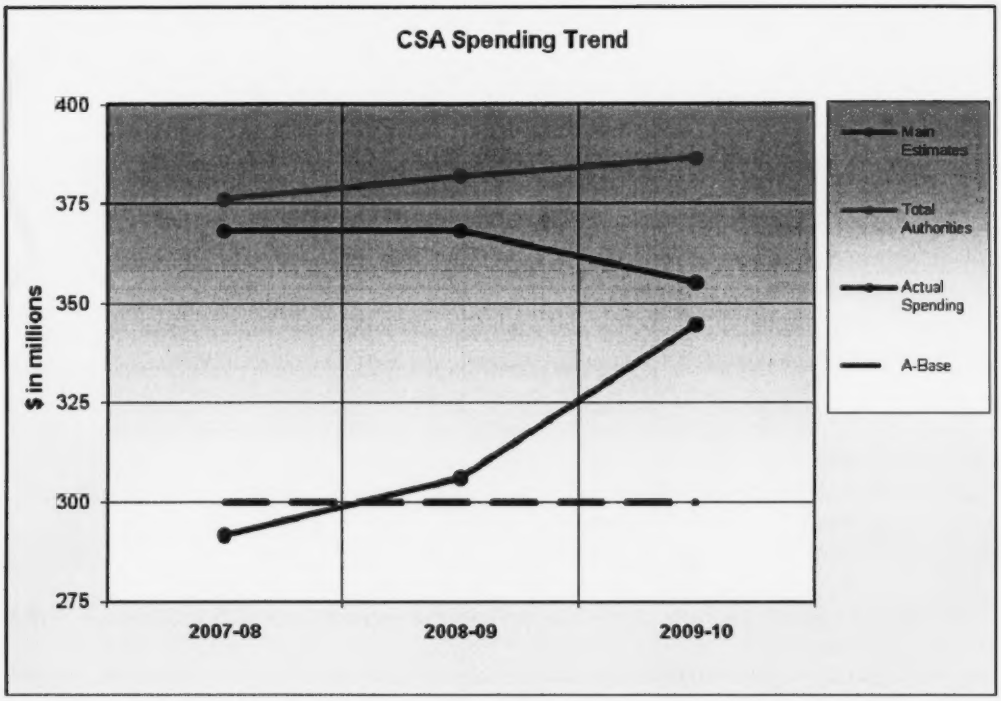
- A staffing blitz was completed with the result that qualified candidates have been identified for 80% of the targeted positions;
- The pool of engineering candidates has progressed as planned; and,
- An action plan was developed to address personnel retention and attrition.

The CSA concluded that this corporate risk remains a high priority and it will pursue a series of ongoing and new mitigation actions in 2010-2011:

- Review Human Resources business processes and work organization;
- Implement a corporate action plan in response to the 2008 Public Service Employee Survey;
- Develop and implement a plan to promote the importance of Public Service Values and Ethics; and,
- Update Human Resources Integrated Plans in line with the new 2011-2012 Program Activity Architecture and the recent CSA reorganization.

1.5 EXPENDITURE PROFILE

1.5.1) Spending Trend



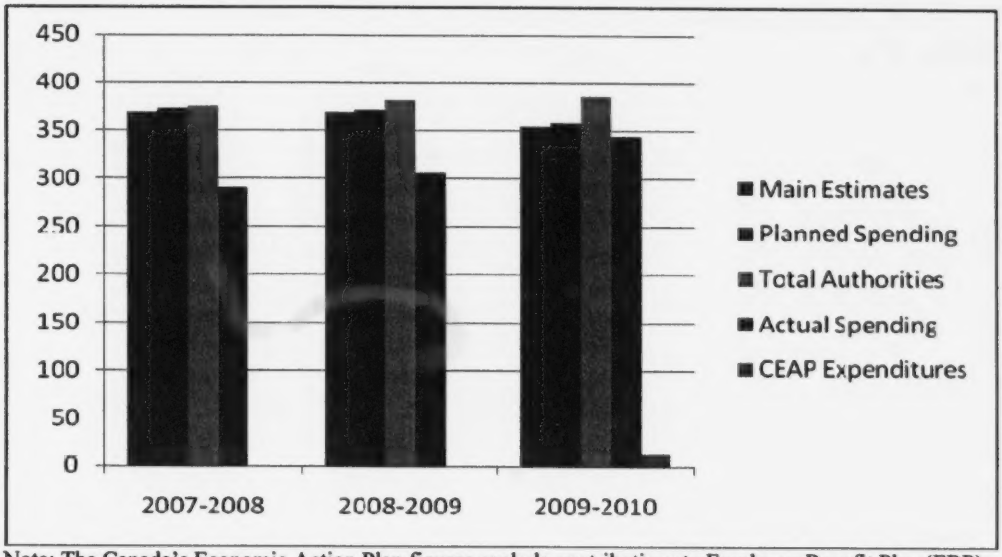
The CSA's A-base funding has been maintained at $300 million per annum since 1999. However, authorities and estimates are significantly higher than this amount and fluctuate from year to year for two main reasons:

1. The incremental funds ($111 million) allocated in Budget 2005 over five years (2005-2006 to 2009-2010) to begin work on the next generation of advanced radar remote sensing satellites (RADARSAT Constellation); and,
2. The cumulative impact of funds reprofiling caused by delays in the implementation of high-risk projects due to a series of uncertainties and technical challenges.

The recurrent annual under-spending results from cumulative reprofilings of Capital funds. In 2009-2010, the results from the 2008-2009 Strategic Expenditure Review and the implementation of the first year of the Budget 2009 Canada's Economic Action Plan also had a minor impact on the spending trend. Nevertheless, the CSA has narrowed significantly the gap between actual spending and main estimates in 2009-2010.

Any significant variance reported against Planned Spending set out in the 2009-2010 Report on Plans and Priorities is explained in Section 3.3.1 – Spending by Program Activity.

1.5.2) Financial information on Canada's Economic Action Plan (CEAP)



Note: The Canada's Economic Action Plan figures exclude contributions to Employee Benefit Plan (EBP).

In Budget 2009, Canada's Economic Action Plan (CEAP) provided the CSA with an additional $110 million over three years for the development of prototypes of a lunar exploration rover, a Mars science rover, and next-generation space robotics systems and technologies for on-orbit servicing. The two main objectives of this initiative are the preservation of Canadian expertise and leadership in space robotics, and increasing Canada's readiness and credibility as a partner for participation in future international space robotics projects and space exploration missions. For more detailed information on the result of the implementation of the CEAP in 2009-2010, go to: Section 2.2 - Canada's Economic Action Plan (CEAP)

1.6 VOTED AND STATUTORY ITEMS

Vote # or Statutory Item (S)	Truncated Vote or Statutory Wording ($ in millions)	2007-2008 Actual Spending	2008-2009 Actual Spending	2009-2010 Main Estimate	2009-2010 Actual Spending
25	Operating expenditures	178.9	196.6	208.0	218.0
30	Capital expenditures	56.8	56.9	90.1	77.0
35	Grants and Contributions	46.7	43.0	47.1	38.5
(S)	Contributions to employee benefit plans	9.2	9.4	9.9	11.1
TOTAL		**291.7**	**306.0**	**355.1**	**344.6**

Note: Totals may not add due to rounding.

SECTION 2: ANALYSIS OF PROGRAM ACTIVITIES BY STRATEGIC OUTCOME

2.1 PROGRAM ACTIVITY PERFORMANCE

The PAA is divided into six program activities; all of which contribute to a single strategic outcome: "*Canada's presence in space meets the needs of Canadians for scientific knowledge, space technology and information*".

2.1.1) Space Based Earth Observation

SPACE BASED EARTH OBSERVATION 2009-2010 PROGRAM ACTIVITY PERFORMANCE MEASUREMENT
BENEFITS FOR CANADIANS Earth Observation (EO) enables monitoring of the environment with unparalleled coverage and scope, enhancing our forecasting capabilities and our understanding of environmental systems. EO data are used for sustainable management and development of natural resources, land use, fisheries and agriculture and providing support for disaster management. EO missions are critical to security and sovereignty, offering cost-effective, wide-area surveillance of land and maritime environments that are difficult to access such as the Northwest Passage. Among Canada's government users benefiting from EO data are Environment Canada, Fisheries and Oceans Canada, the Canadian Ice Service, Natural Resources Canada, the Department of National Defence, and the Provinces and Territories.
EXPECTED RESULT The benefits of activities involved in Earth Observation from space serve Canadian users in the fields of environment, resources and land-use management, and security and sovereignty.
MAIN ACCOMPLISHMENTS IN 2009-2010 RADARSAT-2 is fully operational since April 2008. The Canadian Government has a $445 million credit over the life of the satellite. There is a substantial increase in the use of data by a number Canadian government departments which used data valued at over $34 million in 2009-2010 compared to $13.8 million in 2008-2009. The CSA continued the planning and development of the first of three satellites for the RADARSAT Constellation, the follow-on mission to RADARSAT-2, to be launched in 2014 and 2015. A Preliminary Design, initiated in November 2008, was completed in March 2010 and the detailed design phase started in March 2010. The CSA ensured Canada's commitment, as an official member of the International Charter *Space and Major Disasters*. CSA continued to contribute critical EO images in support of relief, aid and humanitarian efforts undertaken in response to disasters in countries around the world. This year alone CSA has supported 30 Charter activations providing data world-wide for covering different disaster types such as floods, earthquakes, volcanos, oil spills, land slides, and hurricanes.

Indicators	Performance Summary
1. Proportion of active missions relative to the total number of missions supported by Canada in the EO priority areas.	25%; 9 active missions out of 36 supported missions.
2. Number of applications developed as a result of CSA's participation in space missions and/or support to projects/activities in EO considered "operational" from program standards.	A total of 15 applications became operational in 2009-2010.
3. Number of uses of EO data as a result of CSA's participation in space missions and/or support to projects/activities in EO.	A total of 74 uses were reported.

Indicator 1 – Performance Analysis

(Year) = Actual or projected launch date or date of completion when known.

* = New missions in 2009-2010 = 3% (1/36)

EO missions at the Operation stage (9): * = 0

CloudSat (2006), ESA-ENVISAT (2002), ESA-ERS-2 (2005), ESA-GOCE (2009), MOPITT (1999), OSIRIS (2001), RADARSAT-1 (1995), RADARSAT-2 (2008), SCISAT (2003).

EO missions at the Development stage(13): * = 0

RADARSAT Constellation (2014), ESA/JAXA-EarthCARE (2013), ESA-ADM/Aeolus (2009), ESA-Cryosat (2009), ESA-Sentinel-1 (2011), ESA-Sentinel-2 (2012, 2016), ESA-Sentinel-3, ESA-Sentinel-5 Precursor, ESA-SMOS (2009), ESA-Swarm (2011), JC2Sat, NIRST (AQUARIUS / SAC-D) (2010), PROBA-2 (2009).

EO missions under review (14): * = 1

CANSOC, CASS, MCAP, MEOS, MOPITT-2, PCW/PolarSat (weather component) (2016), PHEMOS (Atmospheric component)*, SMAP, Snowsat, SOAR, STEP, SWIFT (Chinook) (2014), TICFIRE, WaMI.

Missions' descriptions can be found in the electronic version of "Analysis of Program Activities by Strategic Outcome – Detailed Performance Information" at the following address: http://www.asc-csa.gc.ca/eng/publications/default.asp#parliament

Indicator 2 – Performance Analysis

A total of 15 applications became operational in 2009-2010 compared to 23 last year; 5 from the EOADP and 10 from GRIP divided as such: 8 monitoring applications (*e.g. Environmental Monitoring, Ecological Integrity, Ice Movement Mapping; Water Quality Monitoring*), 4 detecting applications (*e.g. Oil Slick and Ship Detection; Forest Monitoring; Energy and Biomass Monitoring*), and 3 measuring applications (*e.g. Soil Moisture and Geological and Water Monitoring, Winds and Waves Extraction*).

Source: Internal documents.

Indicator 3 – Performance Analysis

Thirty-five of the 74 uses (47%) reported had national purposes. The uses could be grouped under four main themes: Natural disaster, the Great North/Arctic, Water/Fisheries, Forest/Mining/Agriculture. Here are a few examples taken from CSA's EO Express publication:

Natural catastrophes: Studying satellite radar data from the ENVISAT Earth observation satellite, scientists have begun analyzing the movement of Earth during and after the 6.3 earthquake that shook the medieval town of L'Aquila in central Italy on 6 April. (Edition 34 – topic 11)

In July 2009, heavy rains have caused floods and landslides in mountainous northern regions of Vietnam. According to officials, at least 15 deaths were reported and houses and roads have been destroyed by floods. The Canadian RADARSAT-2 Earth observation satellite is a key resource in a variety of disaster management scenarios. The ability to deliver data to regional authorities is essential for relief operations to map and monitor damage and for assessing the impact. The United Nations Development Program (UNDP) Vietnam has used RADARSAT-1 and RADARSAT-2 flashed-flood products to better manage the event in Nguyen Phuc, Bach Thong, Bac Kan Provinces. (Edition 37 – topic 8)

The Great North/Arctic: The RADARSAT-1 and RADARSAT-2 mosaic of the Foxe Basin region captures the contrast of the icy shallower waters of Foxe Basin with the warmer deeper waters of the Foxe Channel. It ensures the safety of Canadians, their property and their environment by warning them of hazardous ice conditions in Canadian territorial waters; and provides present and future generations of Canadians with sufficient knowledge about their ice environment to support sound environmental policies. (Edition 41 – Topic 4)

Water/Fisheries: Ocean waves are a very important marine physical factor for coastal protection, offshore oil and gas development, transportation, people involved in fisheries, and marine recreation, wind and wave energy farms. Spaceborne synthetic aperture radar (SAR), such as RADARSAT-2, can provide large area high spatial resolution observations of ocean waves under all-weather conditions. Development of new improved retrievals of wave and wind information by means of polarimetric RADARSAT-2 data in open-sea and coastal regions can contribute to improved marine forecasts in these areas. Improved wave and wind information is directly relevant to the Department of Fisheries and Oceans (DFO) priorities. (Edition 35 – Topic 2)

Forest/Mining/Agriculture: Extreme weather along with climate change induced natural disasters is a major concern to all of Canada, particularly to the Canadian Prairies, and each year at least some part of the country is impacted. To monitor drought, crop condition and soil moisture provides crucial information for adaptation and mitigation programs. At regional and national scale, high and medium resolution microwave and optical satellites EO information offers the unique opportunity to derive many surface parameters over a range of temporal and spatial scales. The value added EO data from sensors like ENVISAT/MERIS and RADARSAT-2 are integrated in agriculture related models such as productivity efficiency model (PEM) and Ecological Assimilation of Land and Climate Observations (EALCO). This will further improve agricultural decision making, increase the ability to manage extreme events (e.g. drought, flood), and strengthen the Earth observation capabilities. (Edition 42 – Topic 1)

For more information, go to the electronic version "Analysis of Program Activities by Strategic Outcome – Detailed Performance Information" at the following address:
http://www.asc-csa.gc.ca/asc/eng/resources/publications/default.asp#parliament

To read the CSA's *EO Express* publication, go to:
http://www.asc-csa.gc.ca/eng/newsletters

2009-2010 – Financial Resources ($ in millions)		
Planned Spending	**Total Authorities**	**Actual Spending**
85.8	87.3	75.5
2009-2010 – Human Resources (FTEs)		
Planned	**Actual**	**Difference**
78.0	58.1	19.9

Any significant variance reported against Planned Spending set out in the 2009-2010 Report on Plans and Priorities is explained in Section 3.3.1 – Spending by Program Activity.

To learn more about Earth Observation, go to:
http://www.asc-csa.gc.ca/asc/eng/satellites/default.asp?page=observation

2.1.2) Space Science and Exploration

SPACE SCIENCE AND EXPLORATION 2009-2010 PROGRAM ACTIVITY PERFORMANCE MEASUREMENT	
BENEFITS FOR CANADIANS The CSA sustains and increases Canada's contribution to humankind's scientific knowledge and to the development of space related technologies. Research in physical and life sciences and in space exploration has great potential to bring about socio-economic benefits. Space Science and Exploration (SE) endeavours, which invariably involve international partners, position Canada to play an influential role in building strong and mutually beneficial partnerships with an increasing number of space faring countries. In striving to become one of the most advanced, connected and innovative nation in the world, space science and exploration stimulates some of the brightest minds to contribute to the Canadian economy in an increasingly competitive international environment.	
EXPECTED RESULT Participation in Canadian and international missions expands the scientific knowledge base made available to Canadian academia and research and development communities in the areas of astronomy, space exploration and solar-terrestrial relations, as well as in the physical and life sciences.	
MAIN ACCOMPLISHMENTS IN 2009-2010 As a member of the first permanent six-person crew of the International Space Station (ISS), Dr. Robert Thirsk became the first Canadian astronaut to live and work on the ISS for a six-month period where he assumed responsibilities for the maintenance and repair of the ISS and conducted experiments on behalf of Canadian and international researchers. Astronaut Julie Payette flew on a 15-day mission to the ISS where she used two Canadian and one Japanese robotic arms to install the Kibo Japanese Experiment facilities. These facilities provide an external platform for scientific experiments in the exposed environment of space. The Canadian TriDAR vision system was used on two flights for the docking of the Space Shuttle to the ISS. This advanced technology could be considered for future space exploration missions. CSA completed the testing of critical elements of the James Webb and Indian Space Agency space telescopes. This participation has garnered 5% of observing time for Canadian scientists on the telescopes when launched in 2014.	
Indicators	**Performance**
1. Proportion of active missions relative to the total number of missions supported by Canada in the SE priority areas.	40%; 43 active missions out of 107 missions supported.
2. Number of scientific instruments and technological applications developed as a result of CSA's participation in space missions and/or support to projects/activities in SE.	A combined total of 68 scientific instruments and technological applications.
3. Number of peer-reviewed papers produced in academia and the R&D community in Canada recognizing CSA's support through its participation in space missions and/or support to projects/activities in SE.	A total of 197 peer-reviewed papers, reports and conference proceedings acknowledging CSA funding were published in 2009-2010.

Indicator 1 – Performance Analysis

(Year) = Actual or projected launch date or date of completion when known.
* = New missions in 2009-2010 – 19% (20/107)

*SE missions completed (25): * = 2*
Astronauts: EXPEDITION 20/21 (C1), STS-115 (2006), STS-118 (2007), STS-121 (2006), STS-127 (2009), TMA-6/10S (2005), BLAST (2007), eOSTEO (2007), EVARM, FUSE (2008), HAWAII (2010) *, H-Reflex, ICE-First (2004), Matroshka-R (2008); MSS: STS-114 (2005), STS-119 (2009), STS-123 1J/A DEXTRE (2008), STS-124 (2008), STS-126 (2008); Phoenix (2008), PMDIS (2009), SCCO (2009), TRAC (2008), TriDAR DTO STS-128 (08-2009) *, WISE (2005).

*SE missions at the Operation stage (18): * = 3*
APEX-Cambium (2009), APEX-CSA 2 (2010) *, BCAT-5 (2009), BISE (2009), CADC/Hubble (2008), CCISS (2007), CGSM (2007), ELERAD (2006), ESA-Hershel-HIFI/Spire (2009), ESA-MICAST (2009), ESA-Planck (2009), ESA-SODI DSC *, ESA-SODI IVIDIL *, FPEF-JAXA-Mangaroni Liquid Bridge (2008), MOST (2003), MVIS (2008), THEMIS (2007, 2011), Vascular (2009).

*SE missions at the Development stage (21): * = 7*
ADAMS, BCAT-C1 (2011, 2012) *, BRITE-Constellation (2011) *, CASSIOPE-ePOP (2011), CCAP (2014) *, CHENSS (2014), CIMEX (2011), EBEX, ESA-Exomars (2016) *, ESA-NEQUISOL (2010), ESA-Swarm (2011), Hypersole (2010), ICAPS (2010), JWST-FGS (2014), MSL-APXS (2011), NEOSSat (2011), PRET (2010) *, RADI-N *, SPIDER (2012), TriDAR DTO STS-131 (04-2010) *,UVIT-ASTROSAT (2010).

*SE missions under review (43): * = 8*
Aquatic Orgs in ug *, ASTRO-H (2009) *, CanALSS, Dark Energy Mission (2009) *, DynAMO, ESA-Cross-scale, EVIS, FPNS, GPR, HALO, ILN, Insect Habitat, ISRU, LEMUR, LiteArm, LORE, LSC, Lunar Rover, Luna-Resource-Concept 1 *, Luna-Resource-Concept 2 *, MEMS LIDAR, M-FTSIS, MIM/ATEN, MLM, MSO-FTIR, MSO-SAR, MSR NET (Vision System), MWD, New FRONTIERS *, OCLE-DOCLE, ORBITALS (2014), PHEMOS *, RAO, RAPIER, RAVENS (2004), Remote Care Health Providers, ROSM, SBIS, SCOPE, Si Si-Ge alloys *, SPICA, TRACTEUR, VSE.

Missions' descriptions can be found in the electronic version of "Analysis of Program Activities by Strategic Outcome – Detailed Performance Information" at the following address: http://www.asc-csa.gc.ca/eng/publications/default.asp#parliament

Indicator 2 – Performance Analysis

The total of 68 scientific instruments and technological applications is associated with 35 missions. This number represents an additional 10 instruments/applications compared to last year. When divided by the number of missions, the number of instruments shows a ratio of 1.9 instrument/application per mission; some having a least one related instrument/application up to a maximum of 10 per mission. These 68 instruments/applications can be divided among 4 different fields: 33 instruments/applications were developed for Astronomy/Planetary Exploration missions (49%); 21 instruments/applications for Solar-Terrestrial Relation missions (31%); 11 instruments/applications were developed for Life/Physical Sciences missions (16%), and, 3 instruments/applications were developed for Space Operational Medicine (4%).

Source: Internal documents.

Indicator 3 – Performance Analysis

A total of 197 peer-reviewed papers, reports and conference proceedings acknowledging CSA's funding were published in 2009-2010 in Space Astronomy and Exploration, Solar-Terrestrial Relation, and Physical and Life Sciences. This number represents a 50% decrease from the 397 reported in 2008-2009.

Source: Internal reporting documents.

For more information, go to the electronic version "Analysis of Program Activities by Strategic Outcome – Detailed Performance Information" at the following address: http://www.asc-csa.gc.ca/asc/eng/resources/publications/default.asp#parliament

2009-2010 – Financial Resources ($ in millions)		
Planned Spending	**Total Authorities**	**Actual Spending**
143.3	168.7	153.6
2009-2010 – Human Resources (FTEs)		
Planned	**Annual**	**Difference**
191.9	205.7	(13.8)

Any significant variance reported against Planned Spending set out in the 2009-2010 Report on Plans and Priorities is explained in Section 3.3.1 – Spending by Program Activity.

To learn more about Space Science and Exploration, go to:
http://www.asc-csa.gc.ca/asc/eng/sciences/default.asp and,
http://www.asc-csa.gc.ca/asc/eng/exploration/default.asp

2.1.3) Satellite Communications

SATELLITE COMMUNICATIONS 2009-2010 PROGRAM ACTIVITY PERFORMANCE MEASUREMENT	
BENEFITS FOR CANADIANS Satellite Communications (SC) facilitates the linking of all Canadians by increasing the delivery of non-commercial services to Canadian remote communities, and support federal Government departments' program delivery. Space infrastructure allows access and dissemination of timely health, cultural, security and safety related information to all Canadians wherever they live in Canada. Satellite communications are essential to providing Canadians living in remote areas with timely access to expert knowledge and expertise related to health and education through a range of non-commercial services including: e-government, e-learning, tele-justice, tele-education, as well as tele-medicine.	
EXPECTED RESULT State-of-the-art systems and applications are developed to satisfy the needs of the Canadian government and population in order to ensure that Canada remains a world leader in satellite communications.	
MAIN ACCOMPLISHMENTS IN 2009-2010 The CSA completed the environmental testing of the Cascade telecommunications payload as part of the CASSIOPE Mission which is ready for launch in 2011. The CSA completed the ground segment infrastructure upgrade needed for the utilization of the Government of Canada capacity credit of the Anik F2 satellite by northern communities. The mission and preliminary system requirements for the Polar Communications and Weather mission have started in order to meet the needs for a full-time communications coverage over Canada up to the North Pole.	
Indicators	**Performance**
1. Proportion of active missions relative to the total number of missions supported by Canada in the SC priority areas.	None of the 8 missions were active in 2009-2010.
2. Number of technological applications developed as a result of CSA's participation in space missions and/or support to projects/activities in SC.	8 applications.

Indicator 1 – Performance Analysis

(Year) = Actual or projected launch date or date of completion when known.
* = New missions; None in 2009-2010.

*SC missions at the development stage (5): *=0*
Anik F2 Utilization (2010), CASSIOPE-CASCADE (2010), ESA–Alphasat, ESA-Gallileo SAT (2010), M3MSat (2011).

*SC missions under review (3): *=0*
Next Generation – Advanced Broadband payload # 1 (2014), PCW (telecommunication aspect) (2016), QuickSat.

Missions' descriptions can be found in the electronic version of "Analysis of Program Activities by Strategic Outcome – Detailed Performance Information" at the following address:
http://www.asc-csa.gc.ca/eng/publications/default.asp#parliament

Indicator 2 – Performance Analysis

A total of 8 applications, compared to 5 in 2008-2009, were identified for the 5 missions listed above: Anik F2 ruggedized ground infrastructure and terminal servicing, Cascade (data storage unit) on board CASSIOPE, Antennas and filters for ESA-Alphasat, the MEOSAR instrument on board Galileo satellite and the RSS-GEMS for traffic identification, and 2 Automatic Identification System related applications for M3MSat; 63% of those applications (5/8) were related to Communications whereas the other 37% supported were related to Security/Search and Rescue. All applications, except one, served national objectives; MEOSAR which is developed in collaboration with ESA will serve the international community.

Source: CSA internal documents.

For more information, go to the electronic version "Analysis of Program Activities by Strategic Outcome – Detailed Performance Information" at the following address:
http://www.asc-csa.gc.ca/asc/eng/resources/publications/default.asp#parliament

2009-2010 – Financial Resources ($ in millions)		
Planned Spending	**Total Authorities**	**Actual Spending**
20.3	20.6	19.7
2009-2010 – Human Resources (FTEs)		
Planned	**Annual**	**Difference**
14.2	15.2	(1.0)

Any significant variance reported against Planned Spending set out in the 2009-2010 Report on Plans and Priorities is explained in Section 3.3.1 – Spending by Program Activity.

To learn more about Satellite Communications, go to:
http://www.asc-csa.gc.ca/asc/eng/satellites/default.asp

2.1.4) Generic Technological Activities in support of EO, SE and SC

GENERIC TECHNOLOGICAL ACTIVITIES IN SUPPORT OF EO, SE AND SC

2009-2010 PROGRAM ACTIVITY PERFORMANCE MEASUREMENT

BENEFITS FOR CANADIANS

Through its investments in Research and Development and in the development of applications, and the resulting transfers of technology to the private and public sectors, the CSA's programs and activities attract highly skilled labour that contributes to Canada's knowledge-based economy; help enhance the Canadian space industry's competitiveness by encouraging dynamic trade relationships with other nations; and increase Canada's ability to compete in the global marketplace.

EXPECTED RESULT

Canada's industrial technological capabilities can meet the needs of future space missions and activities.

MAIN ACCOMPLISHMENTS IN 2009-2010

The Generic Technological Activities (GTA) continued to bring industry and research organizations to propose innovative technologies, reduce risk on critical technologies required for future missions of Canadian interest, and contributed to the enhancement of Canadian capabilities.

CSA's portfolio of patents was entirely reviewed. Only patents with the highest potential of being licensed were maintained. Three new licenses were negotiated and five commercial studies were conducted on the potential transfer of emerging technologies to the private sector.

Indicators	Performance
1. Ratio of the number of priority technologies identified for future EO, SE and SC missions to the number of priority technologies developed in GTA.	The number of priority technologies identified was 31. The number of priorities having been financially supported was 15, a ratio of 2.1.
2. Number of priority technologies supported that are ready to be used.	None of the 31 prioritized technologies supported are ready to be used.

Indicator 1 – Performance Analysis

Measured for the second time, the ratio remained the same as last year's 2.1. Over the years, the ratio should get closer to 1, meaning that almost all technological priorities will have been selected and developed.

Source: Internal reporting documents.

Indicator 2 – Performance Analysis

In order to be considered "ready to be use", a technology must reach a level of readiness (TRL) of "6" or higher on the scale developed by NASA. As a new technology proceeds to a higher level of maturity, the risk associated with its implementation in a space mission lessens substantially. Each level represents a development milestones, such as:

TRL 6: System model or prototype demonstration in a relevant environment;
TRL 7: System prototype demonstration in a space environment;
TRL 8: Actual system completed and "flight qualified" through test and demonstration; and,
TRL 9: Actual system "flight proven" through successful mission operations.

It takes time and investment for a new technology to reach these levels of readiness and therefore the priority selection often precedes the actual need and eventual use by several years. None of the newly prioritized technologies reached the "readiness" stage in 2009-2010.

Source: Internal reporting documents.

For more information, go to the electronic version "Analysis of Program Activities by Strategic Outcome – Detailed Performance Information" at the following address: http://www.asc-csa.gc.ca/asc/eng/resources/publications/default.asp#parliament

2009-2010 – Financial Resources ($ in millions)		
Planned Spending	**Total Authorities**	**Actual Spending**
53.8	55.0	43.0
2009-2010 – Human Resources (FTEs)		
Planned	**Annual**	**Difference**
137.7	110.3	27.4

Any significant variance reported against Planned Spending set out in the 2009-2010 Report on Plans and Priorities is explained in Section 3.3.1 – Spending by Program Activity.

2.1.5) Space Awareness and Learning

SPACE AWARENESS AND LEARNING 2009-2010 PROGRAM ACTIVITY PERFORMANCE MEASUREMENT	
BENEFITS FOR CANADIANS The CSA fosters science and technology literacy as a mean to influence the career choices of young Canadians towards science and technology.	
EXPECTED RESULT Targeted level of awareness of space among Canadians is reached.	
MAIN ACCOMPLISHMENTS IN 2009-2010 The number of visitors to the CSA's interactive website decreased by 35% from 1,616 million in 2008-2009 to 1,050 million in 2009-2010. A total of 102 public events were conducted in communities throughout Canada, including 15 specifically involving Canadian astronauts, and 4 traveling exhibits were loaned for display with science center partners to raise awareness of space science and technology. A total of 1,221 educators received professional development in workshops conducted in provinces across the country and at annual conferences of teachers in four provinces: British Columbia, Alberta, Ontario and Prince Edward Island. Students from across the country were reached through an estimated 6,9 million occasions ranging from workshops and learning materials developed by the CSA to activities and events supported by the Space Learning Grants and Contributions Program.	
Indicator	**Performance**
1. Survey results obtained every 3 years.	No National Public Opinion survey was conducted

For more information, go to the electronic version "Analysis of Program Activities by Strategic Outcome – Detailed Performance Information" at the following address: http://www.asc-csa.gc.ca/asc/eng/resources/publications/default.asp#parliament

2009-2010 – Financial Resources ($ in millions)		
Planned Spending	**Total Authorities**	**Actual Spending**
8.9	8.9	5.9
2009-2010 – Human Resources (FTEs)		
Planned	**Annual**	**Difference**
26.0	24.0	2.0

Any significant variance reported against Planned Spending set out in the 2009-2010 Report on Plans and Priorities is explained in Section 3.3.1 – Spending by Program Activity.

To learn more about Space Awareness and Learning, go to: http://www.asc-csa.gc.ca/asc/eng/educators/default.asp

2.1.6) Internal Services

INTERNAL SERVICES 2009-2010 PROGRAM ACTIVITY PERFORMANCE MEASUREMENT	
BENEFITS FOR CANADIANS The CSA strengthened accountability for results by implementing the Government's commitment to modernize Public Service management. Improvement of internal services at all levels of management raises the overall level of organizational performance by providing an added value to CSA managers in the performance of their duties.	
EXPECTED RESULT #1 Internal Services provide an added value to CSA managers in the performance of their duties.	
Indicator	**Performance**
1. Services provided meet standards set under Government-wide and CSA policies as well as Management Accountability Framework (MAF) expectations.	MAF rating from the 2009-2010 Round VII assessments against the 19 area of management indicators were: Strong = 0 Acceptable = 15 Opportunity for improvement = 4 Attention required = 0
Indicator 1 – Performance Analysis The Treasury Board's assessment addresses only indicators related to management quality. Overall, the results are slightly better than the assessment in 2008-2009. Compared to 2008-2009, 4 areas of management have improved, 14 have remained the same, 1 has declined. The number of areas of management at the acceptable level increased from 13 to 15 and the number of areas showing an opportunity for improvement declined from 5 to 4. Since the Round VI assessment, the CSA has assigned an officer of primary interest for each areas of management and a compliance report is used to monitor progress being made to achieve targeted ratings. Source: Round VII 2009-2010 Management Accountability Framework Assessment. (May 2010)	

EXPECTED RESULT #2

The three highest priority risks identified in the CSA Corporate Risk Profile are addressed and mitigated.

Indicator	Performance
1. Mitigation action plans are implemented against the three corporate risks identified as highest priorities.	Overall, 14 out of 23 (61%) risk mitigation actions were completed in 2009-2010.

Indicator 1 – Performance Analysis

Six out of 12 actions (50%) were completed for the corporate risk *Integration and implementation* defined as "The capacity of CSA to align its strategies, planning, priorities, funding levels, operations and capacity to deliver, and to obtain clear understanding and buy-in from managers and staff at all levels". The corporate risk assessment concluded that this risk remains a high priority and a mitigation action plan was developed.

Five out of the 7 (71%) actions were completed for the corporate risk *Workforce* defined as "The capacity of CSA to hire and maintain a qualified workforce of public servants to deliver its mandate." The corporate risk assessment concluded that this risk remains a high priority and a mitigation action plan was developed.

Three out of 4 actions (75%) were completed for the corporate risk *Trust in CSA Governance* defined as "The capacity of CSA in gaining and maintaining the confidence of the Minister, Central Agencies and stakeholders in the governance and effective management of its affairs in accordance with the Public Service Values and Ethics". The corporate risk assessment concluded that this risk is no longer a high priority.

Source: CSA Corporate Risk Profile (Internal document).

For more information, go to the electronic version "Analysis of Program Activities by Strategic Outcome – Detailed Performance Information" at the following address: http://www.asc-csa.gc.ca/asc/eng/resources/publications/default.asp#parliament

2009-2010 – Financial Resources ($ in millions)		
Planned Spending	**Total Authorities**	**Actual Spending**
43.0	45.9	46.9
2009-2010 – Human Resources (FTEs)		
Planned	**Annual**	**Difference**
263.4	249.7	13.7

Any significant variance reported against Planned Spending set out in the 2009-2010 Report on Plans and Priorities is explained in Section 3.3.1 – Spending by Program Activity.

2.2 CANADA'S ECONOMIC ACTION PLAN (CEAP)

With Budget 2009 and the *Canada's Economic Action Plan* (CEAP), the Government reinforced its vision and commitment to drive world-class scientific research and leading-edge innovative technologies. Space exploration, science, and technology endeavours build strong and mutually beneficial partnerships with an increasing number of space faring countries, and contributed to the prosperity of global commerce and to the safety of Canadians through the peaceful use of space.

For the Canadian space community the CEAP committed $110 million over a 3-year period to be contracted-out to Canadian industries, with the possibility of sub-contracts to universities. The two main objectives are:

- The preservation and growth of Canadian expertise and leadership in space robotics; and,
- The increased readiness and credibility of Canada as a partner for future space robotics projects and general space exploration.

In 2009-2010, 10 existing contracts were extended and 12 new contracts were awarded under the CSA current exploration core program to develop and perform prototyping of systems that could become potential contributions to future international Moon or Mars missions. Seven out of the nine advanced concept studies initiated in 2008-2009 were completed and two contracts for advanced concept studies for a vision system for a Russian lunar rover were put in place. The prototyping option in the nine advance concept studies were exercised for prototype development. The work resulting from these contracts enabled CSA to participate in February 2010 in a successful international terrestrial mission at an analogue site, similar in terrain with lunar and Mars landscapes.

The remaining contracts were awarded as part of the Exploration Surface Mobility (ESM) project for the delivery of a number of payloads: small manipulator, mini-corer, microscope, micro-rovers, generic payload interface, next generation power system, next generation communication system and an ExoMars mission breadboard analogue deployment scheduled to take place in June 2010.

SECTION 3: SUPPLEMENTARY INFORMATION

3.1 FINANCIAL HIGHLIGHTS

3.1.1) Condensed Statement of Financial Position

(As at March 31)

	($ in thousands)	Percentage Variance	2010	2009 Restated
Assets	Total Assets	-3.9%	1,441,861	1,500,002
Liabilities	Total Liabilities	7.4%	114,303	106,423
Equity	Total Equity	-4.7%	1,327,558	1,393,579
Total		-3.9%	1,441,861	1,500,002

3.1.2) Condensed Statement of Financial Operations

(For the period ending March 31)

	($ in thousands)	Percentage Variance	2010	2009
Expenses	Total Expenses	9.1%	411,350	376,975
Revenues	Total Revenues	-52.2%	3,280	6,861
Net Cost of Operations		10.3%	408,070	370,114

3.1.3) Financial Statements

Information on CSA's Financial Statements is at the following address:
http://www.asc-csa.gc.ca/eng/publications/default.asp#parliament

3.2 SUPPLEMENTARY INFORMATION TABLES

Electronic supplementary information tables listed in the 2009-2010 Departmental Performance Report can be found on the Treasury Board of Canada Secretariat's website at: http://www.tbs-sct.gc.ca/dpr-rmr/2008-2009/index-eng.asp.

- Sources of Non-Respendable Revenue
- User Fees Reporting
- Status Report on Projects Operating with Specific Treasury Board Approval
- Status Report on Major Crown / Transformational Projects
- Details on Transfer Payment Programs (TPPs)
- Response to Parliamentary Committees and External Audits
- Internal Audits and Evaluations

3.3 OTHER ITEMS OF INTEREST

3.3.1) Spending by Program Activity

Description	Planned Spending ($ in millions)	Actual ($ in millions)	Variance ($ in millions)
Space Based Earth Observation	85.8	75.5	10.3
Comments: The variance of $10.3 million was mainly due to the following factors: - Reprofiling of $4.0 million for RADARSAT Constellation Major Crown Project caused by slight delays which occurred in the finalization of some requirements further to the System Requirements Review. Also projects risks did not materialize in FY 2009-2010 but will persist in 2010-2011. - Extended reprofiling of $3.2 million by using the flexibility mechanism to address fluctuations in exchange rate between Canadian and Euro currencies for transfer payments to the European Space Agency (ESA). - Reallocation of $1.1 million from Space Based Earth Observation Program Activity to Space Science and Exploration, and Satellite Communications Program Activities mainly for M3MSat and NEOSSat Projects. - Spending reduction of $2.1 million caused delays in staffing activities.			
Space Science and Exploration	143.3	153.6	(10.3)
Comments: The variance of ($10.3 million) was mainly due to the following factors: - Spending increase of $13.2 million in Enabling Research activities for the implementation of the Stimulus Initiative to support the development of advanced robotics and other space technologies as part of the Budget 2009 Canadian Economic Action Plan. - Spending increase of $1.4 million mainly due to Collective agreement adjustments. - Reprofiling of $4.0 million caused by late delivery and issues encountered with two critical sub-components for James Webb Space Telescope.			
Satellite Communications	20.3	19.7	0.6
Comments: No significant variance between Planned Spending and Actual for Satellite Communications Program Activity.			

Description	Planned Spending ($ in millions)	Actual ($ in millions)	Variance ($ in millions)
Generic Technological Activities in support of EO, SE and SC	53.8	43.0	10.8
Comments: The variance of $10.8 million was mainly due to the following factors: - Extended reprofiling of $2.7 million by using flexibility mechanism to address fluctuations in exchange rate between Canadian and Euro currencies for transfer payments to the European Space Agency (ESA). - Spending reduction of $1.4 million following the 2008 Strategic Expenditure Review. - Spending reduction of $3.7 million caused by delays in putting contracts in place and by difficulties for some contractors to deliver according to initial schedule mainly for Space Technology Development Program, as well as delays in staffing activities. - Reallocation of $3.3 million to Space Science and Exploration Program Activity mainly for the New Class Grant and Contribution Program.			
Space Awareness and Learning	8.9	5.9	3.0
Comments: The variance of $3.0 million was mainly due to the following factors: - Reallocation of $2.7 million to Space Science and Exploration Program Activity mainly for the maintenance and upgrading of the Mobile Services System.			
Internal Services	43.0	46.9	(3.9)
Comments: The variance of $3.9 million was mainly due to the following factors: - Spending increase of $1.4 million mainly due to Collective Agreement, EBP and Reimbursement of eligible pay list expenditure adjustments. - Spending increase of $2.5 million taken from other Program Activities mainly to cover costs for IMIT system upgrades, storage and backup equipment.			

3.3.2) FTEs Variance (Full-time Equivalent)

In 2009-2010, the difference of 49 between planned and actual FTEs is mainly due to delays in staffing activities. However, this shows a significant improvement from the previous year which had ended with a difference of 103 FTEs. This improvement is a result of:

- Better planning of FTE requirements which decreased from 724 to 711; and,
- The implementation of a corporate staffing action plan which increased actual FTEs from 620 to 662.

3.3.3) List of Space Missions

A description of missions can be found in the electronic document called: "Analysis of Program Activities by Strategic Outcome – Detailed Performance Information" at the following address: http://www.asc-csa.gc.ca/eng/publications/default.asp#parliament